§3. Dependence of Energy Confinement Time on Magnetic Configuration

Yamada, H.

The dependence of global confinement on the magnetic configuration has been surveyed. The confinement enhancement over the ISS95 scaling with different magnetic axes is shown in Fig.1 (a). Performance of global confinement deteriorates monotonically from the inward shifted configuration to the outward shifted configuration. Although the configuration with R_{ax}=3.55m is the best when the energy confinement time is normalized by ISS95, the configuration with R_{ax}=3.6m has the best performance in the absolute value because of 12 % larger volume than the case with R_{ax}=3.55m. Figure 1(b) shows the dependence of the confinement enhancement factor on the plasma ellpticity. Here the magnetic axis is fixed at 3.6 m. This geometry scan indicates that the standard configuration with toroidal averaged circular cross-section has the best performance in absolute value as well as in a normalized evaluation.

The enhancement factor of a core confinement time derived from W_{core}/P_{abs} where $W_{core} = \int_{\rho=0}^{\rho=0.9} (p(\rho) - p(0.9))dV$ are also plotted in Fig.1. The dependence of the core confinement time on the magnetic geometry follows the trend of the entire confinement time in trend. This also means that the remainder, i.e., the pedestal part expediently defined by □=0.9 shows a dependence similar to those in the core and the entire treatment. However, a quantitative difference is observed depending on the configuration. When the energy confinement is compared for the cases with R_{ax}= 3.6 m and 3.75 m, the case with R_{ax}= 3.6m shows enhancements of 1.48, 1.68, and 1.27 for the total, core and pedestal parts, respectively. Remarkable confinement improvement in the inward shifted configuration owes to the improvement in the core region and the improvement in the edge has less contribution. The dependence on an ellipticity shows that the vertically elongated configuration (k=1.17) has less contribution from the pedestal part, while no difference is observed between the cases with k=1.02 and 0.92.

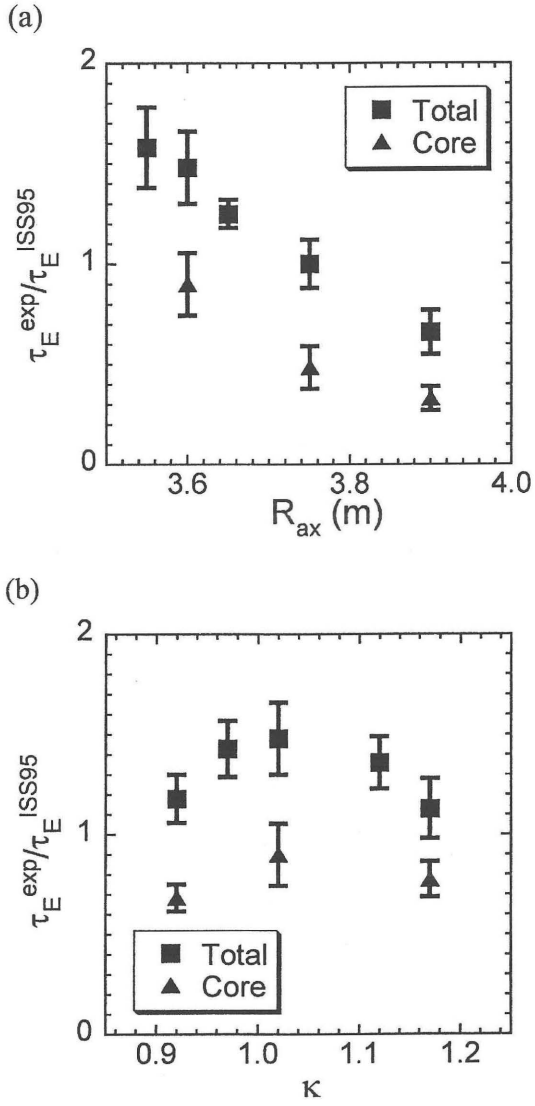

Fig.1. Dependence of confinement enhancement on magnetic geometry. (a) Magnetic axis position. (b)Ellipticity